IoT based Intelligent Bus Monitoring System

Dr. N. Dhanasekar
Associate Professor
Dept of EEE- A.V.C
College of Eng

Chitra Valavan
Professor
Dept of ECE-A.V.C
College of Eng

S. Soundarya
Dept of ECE-A.V.C
College of Eng

Abstract:- **On reviewing the past work of college bus tracking, monitoring and alerting system, there is a possibility to categorize various methodologies and identify new trends. One among them is a challenge for vehicle tracking, monitoring and alerting system. Now- a-days with the increase in the crime rate and accidents, parents worry about their wards when they are going to colleges. And many Students find themselves locked in a college bus in the bus parking lot after falling asleep on their way to college, miss the bus, or leave at the wrong station. This project makes use of the applicability of radio frequency identification (RFID) technology for tracking and monitoring Student during their trip to and from college on college busses. And it has the advantage of efficient tracking capabilities, low cost and easy maintenance. The individual RFID tags are effective and it is used for tracking and monitoring Student. Fire sensor is also used in this project to detect any fire accidents. Speed of the bus also can be calculated and send a message to the parents through GSM. The system consists of three main units, bus unit, parent unit and college unit. The bus unit is used to detect when a Student enters/exits from the bus using RFID Card. This information is communicated to the parent unit and college unit that identify the presence of Student. The system tracks the college bus by the IOT and also gets an alert if the bus crosses the speed limit.**

Keywords: Global Position System, Radio Frequency Identification, Global System for Mobile Communication, PIC16F877Amicrocontroller, Sensors.

INTRODUCTION

When it comes to public transportation, time and patience are essential. In other words, many people using public transport buses have experienced time loss because of waiting at the bus stops. Millions of Student need to travel from home to college and vice versa every day. For parents, obtaining a safe transport for their Student is a critical issue. Crime against Student is increasing and every parent is requesting the respective college for the security of their Student while traveling from college to home and vice versa in college bus. The system will notify parents by SMS whenever Student enters or leaves college bus, this will assure parents that Student are safely reached to destination. Count through IR sensor will ensure that is college bus is vacant or still any Student are inside the college bus.

In this paper, smart bus tracking system has been proposed that when any student enter into bus the alert massage will send to their parents and also arrival times, buses current locations, and bus routes on a map can be easily found out with the help of IOT. GPS (Global Positioning System) and Google maps are used for navigation and display services respectively.GSM (Global System of Mobile Communication) used for sending alert message. Millions of Student need to be moved from home to college and vice versa every day. For their parents, getting a safe transport for their Student is a crucial issue. At present days all are very much aware about the safety concerns. At the same time parents can send their Student to colleges which have high reputation and all facilities.

WORKING PRINCIPLE

Now-a-days all colleges have bus facilities, even by their Student are going to college through college bus parents have some worry about their Student, whether they reached safely or in a dangerous situation. This system gives an alert message when Student boards and leaves the bus using the RFID tag wore by the Student by placing that tag before the RFID reader . The sensors and RFID reader are interfaced with Microcontroller. Each RFID tag has an information about and individual Student which was sensed by an RFID reader transmit the corresponding information to their parents using GSM. The outputs of this controller board are given to GSM module and LCD display. This GSM modem can sends the messages to authorized persons according to the received data.

For instance, the Australian College of Road Safety says that bus travelling in the safest form of road transport system is safer than the private car for the Student, and that the record for college bus travel in particular is very good. Global Positioning System and Global system for mobile communication module is designed for tracking and positioning the college bus. Also, the research undertaken by National Highway Traffic Safety Administration in USA notes that when comparing the number of fatalities of Student aged 5 to 18 years during normal college transportation hours, college buses are 87 times safer than private cars.

However, headlines like "Girl dies in bus tragedy" from the May 18, 2010 issue of the Peninsula newspaper in Qatar seems to be repeated several times every year in different places of the world. This system will issue the messages to parents to convey them that their Student are reached to college safely, and they are in the college and also give an alert message if any fire accident occurs. LCD displays the message about the speed of the college bus. The tracking system includes the location and speed of the vehicle in current movement, speed of the vehicle is monitored and then sms alert is send to the parents through the GSM .

The proposed system shows that the RFID tracking

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technology is a practical option for monitoring and tracking the Student during their trip to and from college on college bus. The system tracks the college bus by the GPS Module and also gives an alert if the bus crosses the speed limit. The GPS Module is used for Live Tracking of the College Buses and alerting if fire accident occurs and send an alert message to the parents, college and also for the fire engine.

The system monitors the Student inside the bus in a safer manner. It uses the combination of RFID (Radio Frequency identification), GPS (Global Position System) technologies. Each Student carries a unique RFID card embedded in each of the student's college bags. When the student enters or exits from the bus the reader records and transfer data in the database.

Radio Frequency identification (RFID) is used to transmit Information of a subject using radio waves. This information consists of unique digital number which differentiates various objects. An RFID system is made up of two different parts viz. RFID tag and RFID reader. There is a microchip antenna inside tag; This chip consists of useful data in different forms. A study has showed that, the performance of reader decreases rapidly with increase in a distance. Student carries the unique RFID card. This RFID card is embedded on his own smartcard. When Student in or out from college bus, reader will record a response and send an alert to parents and college.

BLOCK DIAGRAM

The system shows an efficient and systematic way of using RFID tracking applications coupled with smart phone technologies to fulfill the key security and monitoring purposes. In order to optimize the proposal, this paper investigated the effects of variable localization of RFID tags from reader and power loss, inefficiency and distance constraints caused due to equal power allocations to the tags. Reducing the number of reader by using smart antenna in RFID and increasing coverage area, several other sectors will be hopefully able to leverage the benefits of RFID technology.
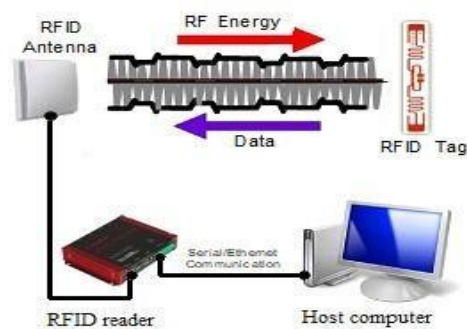

FIGURE: 1 TYPICAL PASSIVE RFID SYSTEM

The RFID reader consists of an antenna, power supply, processor, transceiver and an interface for connecting it to a host computer (i.e. via serial port, or Ethernet). The RFID tag has an antenna, a transceiver, and an Integrated Circuit

(IC) with memory. The performance of the RFID tag is determined by factors such as IC technology used, the read/write capability, the read range, the radio frequency, and external factors such as the environment and packaging.

In this system PIC16F877A microcontroller has been used. The system consists of three units, bus unit, college unit and parent unit. Bus unit consists of RFID Reader, different sensors and GSM module to issue the alert messages to parents when their Student boards or leaves the bus. Fire sensor will be placed within the bus unit to detect fire and issues alert messages by giving the location of the bus using GSM module and IOT. College unit consists of RFID Reader and GSM Module. The entire data in two units will be processed by using PIC16F877A microcontroller.

PIC16F877A microcontroller is used in this system. This processor has advantages like, total number of pins 40 and there are 30 pins for input and outputs, 368 RAM bytes, 5MIPS CPU speed, 8 channels of 10 bit ADC converter is used.
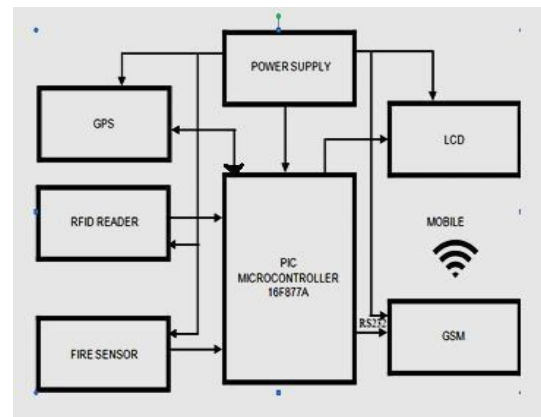

FIGURE: 2 BLOCK DIAGRAM

In this system fire sensor is used to detect the fire accident. If there any fire accident occurs, the sensors receives a physical signal and transmit a digital signal to a GSM module. The alert message will be send to the college unit and parents with the help of GSM and IOT. Each student consists of an individual RFID tag with the help of RFID tag, GSM, IOT. Parents and college unit can receives an alert message. The information of RFID tag is read by RFID reader. The reader transmits the corresponding information. RFID tag is used to send an alert message like the location of a person, speed of the bus to their respective parents. In this system GSM and IOT is used to send the alert message to the parents if their respective Student is get in the bus or get down the bus with the help of RFID tag and reader.

LCD stands for Liquid Crystal Display is a flat panel display technology commonly used in TVs and computer monitors. It is also used in screens for mobile devices, such as laptops, tablets, and smart phones. The backlight in liquid crystal display provides an even light source behind the screen. This light is polarized, meaning only

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half of the light shines through to the liquid crystal layer. The liquid crystals are made up of a part solid, part liquid substance that can be "twisted" by applying electrical voltage to them. They block the polarized light when they are off, but reflect red, green, or blue light when activated.

A DC Power Supply Unit (commonly called a PSU) deriving power from the AC mains (line) supply performs a number of tasks: It changes (in most cases reduces) the level of supply to a value suitable for driving the load circuit. It produces a DC supply from the mains (or line) supply AC sine wave. It prevents any AC from appearing at the supply output. Power supplies in recent times have greatly improved in reliability but, because they have to handle considerably higher voltages and currents than any or most of the circuitry they supply, they are often the most susceptible to failure of any part of an electronic system.

GPS is a satellite navigation system used to determine the ground position of an object. Each GPS satellite broad casts a message that includes the satellite's current position, orbit, and exact time. A GPS receiver combines the broadcasts from multiple satellites to calculate its exact position using a process called triangulation.

IMPLEMENTATION

In this paper, college bus tracking and monitoring has been proposed. RFID is used for the identification of the Student. Each student has their individual RFID tag with the help of the RFID tag the student can monitored by their parents and also by college. When the student enters or exits from the bus the reader records and transfer data in the database.

For every entry and exit RFID tag is sensed by the RFID reader. The number of students can be counted in the bus. Her front door is considered as the entry door and rear door is considered as the exit door. Sensor is fixed on both the doors and the sensor count the exit and entry of the student. Only one person can entry or exit at a time. The RFID reader read the tag and send an alert message to their respective parents through GPS and GSM module. The front door sensor increase the count. The rear door sensor decrease the count and both the sensor calculate the total number of students present. Fire sensor is used to detect if any fire accident occurs, it will send an alert message to parents, college, and fire engine. The tracking system details will be sent to the server at the college side for storage and on the mobile device to the parents. The information of students is stored in a database at a college side.

The proposed system is used to detect the speed of the vehicle and send an alert to the parents, if the bus cross the speed limit. Parents use the Google map in android to track the bus. If the parents open the Google map the speed of the bus and the current location of the bus can display in the android. The GSM and GPS module is used to send the alert message to the parents and also to the college unit. The LCD display is fixed in the college bus to display the of the identification student to the driver. The proposed

system is used to intimate parents about the bus location and also about the Student boarding to the college bus. The system addressed the problem faced by parents of waiting on the bus stop for long duration. The system includes RFID identification and the GPS is used for tracker which is inbuilt in the android for unique the location phone the complete location and Student details are stored in the database.

Each student has the unique key at the college side to display the student details not only at the entry and exit of the student at any time. If the first key is pressed the respective student details displayed in the android mobile in college unit. A key is fixed in a bus unit at a driver side to send an alert message to parents which overcomes the problem faced by the parents of waiting on the bus stop for long duration. Driver press the key for every 5 minutes for that GSM module send an alert message for the nearby stops which fixed in a database.

The GPS module which is present in the android mobile starts to track the location of the bus in the form of latitude and longitude with the help of GSM module which is fixed in the bus unit.
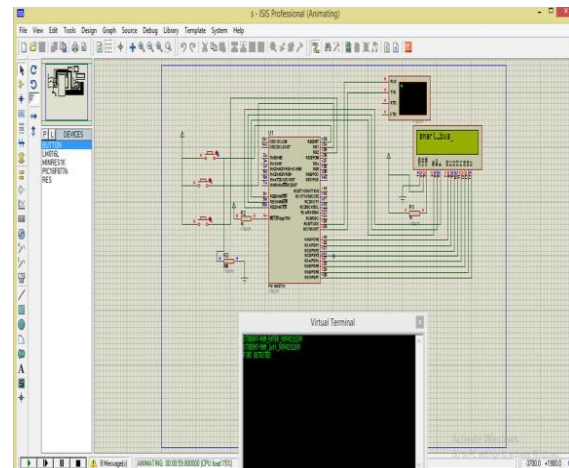

FIGURE: 3 SIMULATION RESULT

The Proposed System consists of hardware parts and android and web based application as shown in the Figure 2. The proposed system is divided into 3 main units as shown in figure 3.

A. Bus unit
B. Parent unit
C. College unit

BUS UNIT

The Bus Unit is used for detecting the Student when the Student enters and exits the bus and send this information. The Bus Unit is used for detecting the Student when the Student enters and exits the bus and send this information to the College Unit as well as parent unit. The Bus Unit to the College Unit as well as parent unit.

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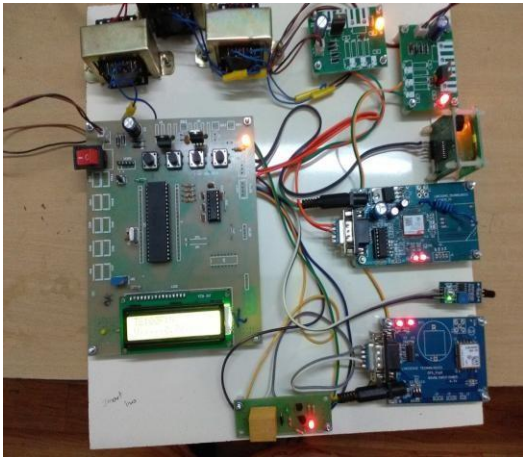
The Bus Unit consists of:

FIGURE: 4 OVERALL VIEW OF 3 MODULES

- RFID Technology: RFID Reader and RFID Tag(Radio Frequency Identification Detection).
- GPS Module: Global Positioning System.
- GSM Modem: Global System for Mobile Communication.
- Switch
- PIC16F877A Microcontroller.

The functions of RFID Reader are integrated with the RFID Tags. The RFID Reader is attached at the entrance of the bus and the RFID Reader module works as both transmitter and receiver of the radio frequency signals. The RFID Tag is enhanced in students ID card. The GSM/GPRS Modem is used for communication with the Server via GPRS and GSM SIM. The GPS Module is used for Live Tracking of the College Buses and alerting if the bus crosses the speed limit in build in GPS Module. The switch board consists of a button where, when the bus is in major trouble can press the button as by microcontroller can communicate with the server.

A.PARENT UNIT

The Parent Unit consist of an Android Application where the Parent Sign up with the mobile number registered in the College Database Server and Login into the account to get the Student's notifications automatically from the College Database Server and can also be able to track the bus in which the Student is traveling. The Parent Unit consist of an Android Application where the Parent Sign up with the mobile number registered in the College Database Server and Login into the account to get the Student's notifications automatically from the College Database Server and can also be able to track the bus in which the Student is traveling.

Figure: 5 LCD Module displaying the position using GPS

The Parents who are not able to use the Android Application the messages will be send in the Inbox of the Parent Phone. There is the drawback for the Parents who are not using Android Application; they could not able to view the live bus location.

COLLEGE UNIT

The College Unit consists of a Web Based Application were the Admin can be able to do all the Master Entries like Add, Delete, Update, Modify the details of the College Buses, Students, Routes, Stops and many more as required and hence it has been saved on the Server. Via GPS Module attached in the Buses; the College Unit can able to view the bus locations of the Buses on the Google Map with optimized route and schedule given to cover each stops from source to destination. The College Unit gets the alert message instantly when the Bus Crosses the Speed Limit.

The College Unit keeps the records of the students, buses, routes, stops, speed of bus as well as the overall history with Student in/out, time into/from the bus; assigned optimized bus route, cover all the stops, etc. These all are included in the Reports on the Web Based Application which is been able to view by the Admin only.

COLLEGE DATABASE SERVER

The College Database Server contains overall database for the Student safety and is responsible for transmitting the received data from the Microcontroller into useful services. The Server filters and analyses the received data, track the real time current location of the buses, generate alert messages, notifications and reports and so on. College Database Server consist databases like students information, their parents details, college buses details and need some of the algorithms to complete the task like sending notification of specified parents in the database of each and every activity of the student and the bus details. College Database Server also includes data College Unit with the location of the Bus with showing optimized route to reach the bus location on the Google map

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CONCLUSION

This proposed system aims at enhancing the safety of Student during the daily transportation to and from college. RFID Reader located inside the bus detects the RFID tags of the Student. It sends instant notification with the relevant data from the college database server via internet. The parents can log into the Application and monitor the details of their Student and track the location of the bus. The admin can add stops, and generate an optimized route and can have a live tracking of the bus. Further this system can be enhanced by Parking Management System, having VANET for bus to bus communication. This system can be extended for full-time monitoring of Student that will be helpful for parents and guardians at minimum cost.

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